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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/553,860	10/20/2005	Norishige Nanai	10873.1744USWO	6567

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EXAMINER

GOODWIN, DAVID J

ART UNIT	PAPER NUMBER
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2818

DATE MAILED: 10/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/553,860

Applicant(s)

NANAI ET AL.

Examiner

David Goodwin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 20 October 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 October 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
- Paper No(s)/Mail Date 10/20/05.

- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Objections*

Claims 13, 14, and 15 are objected to because of the following informalities:

The claims recite the limitation "an imine nitrogen not containing polymer" this is not supported by the specification. The examiner believes that the intended limitation is "a polymer not containing imine nitrogen." Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1 through 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dodabalpur (US 6,278,127) in view of Shim (Moonsub Shim et al., "Polymer Functionalization for Air-Stable n-Type Carbon Nanotube Field-Effect Transistors", J. Am. Chem. Soc. 123, pp. 11512-11513 (2001)).
3. Regarding claim 1.
4. Dodabalpur teaches a semiconductor device. Said device comprises a gate electrode (14) formed on a substrate (11). A gate insulation layer (15) formed on the gate electrode (14). A source electrode (12) and a drain electrode (13) that are formed on the gate insulation layer (15). An n type semiconductor layer (21) formed between the source electrode (12) and the drain electrode (13) so as to contact with the source

electrode (12) and the drain electrode (13) (fig 2) (column 5 lines 5-45). Said semiconductor comprises fullerenes (column 3 lines 45-60).

5. Dodabalpur does not teach the composition of the fullerene semiconductor layer.

6. Shim teaches an n type fullerene semiconductor layer. Said n type fullerene semiconductor layer comprises nanotubes with an n type modifying polymer, polyethylene imine, on the surface thereof (paragraphs 3-6).

7. It would have been obvious to one of ordinary skill in the art to use an n type fullerene comprising nanotubes with n type modifying polymer thereon in order to obtain an air stable n type semiconductor.

8. Regarding claim 2

9. Shin teaches that the modifying polymer is an imine nitrogen containing polymer, polyethylene imine (paragraph 4).

10. Regarding claim 3.

11. Shin teaches that the modifying polymer is a polyalkylene imine, polyethylene imine (paragraph 4).

12. Regarding claim 4.

13. Shin teaches that the modifying polymer is polyethylene imine (paragraph 4).

14. Regarding claim 5.

15. Dodabalpur further teaches forming a resin protective layer on the n type semiconductor layer (column 9 lines 10-30).

16. Regarding claim 6.

17. Claims directed towards the structure of the device must distinguish from the prior art based upon structural differences rather than the processes by which the product is made (MPEP 2113).

18. Claims 7 through 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bai (US 2004/0222412) in view of Shim (Moonsub Shim et al., "Polymer Functionalization for Air-Stable n-Type Carbon Nanotube Field-Effect Transistors", J. Am. Chem. Soc. 123, pp. 11512-11513 (2001)) in view of Takenaka (US 6,882,016).

19. Regarding claim 7.

20. Bai teaches an array comprising first and second semiconductor devices on a substrate (612) (fig 6). Said devices comprise a gate electrode (614) formed on the substrate (612) a gate insulation layer (616) formed on the gate electrode (614) a source electrode and a drain electrode (624) formed on the gate insulation layer (616). A semiconductor layer (620) formed between the source electrode and the drain electrode (624) so as to contact the source electrode and the drain electrode (624) (fig 6) (paragraph 0135). Said semiconductor comprises fullerenes (paragraphs 0089-0091).

21. Bai does not teach the composition of the fullerene semiconductor material.

22. Shim teaches an n type fullerene semiconductor layer. Said n type fullerene semiconductor layer comprises nanotubes with an n type modifying polymer, polyethylene imine, on the surface thereof (paragraphs 3-6). Further Shim teaches a p type fullerene semiconductor material comprising a nanotube material (paragraphs 3-6).

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23. It would have been obvious to one of ordinary skill in the art to use nanotubes to form p type TFTs and nanotubes with polyethylene imine on the surface thereof to make n type TFTs in order to obtain a reduced device size.

24. Bai in view of Shim does not teach that a first semiconductor device comprises an n type FET and a second semiconductor device comprises a p type FET.

25. Takenaka teaches an array which comprising a first semiconductor device which comprises an n type FET and a second semiconductor device which comprises a p type FET (fig 15, 16) (column 18 lines 5-67).

26. It would have been obvious to one of ordinary skill in the art to incorporate n type FETs and p type FETs on a substrate so that the devices can be controlled enabling current to be supplied to specific elements.

27. Regarding claim 8.

28. Shin teaches that the modifying polymer is an imine nitrogen containing polymer, polyethylene imine (paragraph 4).

29. Regarding claim 9.

30. Shin teaches that the modifying polymer is a polyalkylne imine, polyethylene imine (paragraph 4).

31. Regarding claim 10.

32. Shin teaches that the modifying polymer is a polyethylene imine (paragraph 4).

33. Regarding claim 12.

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34. Claims directed towards the structure of the device must distinguish from the prior art based upon structural differences rather than the processes by which the product is made (MPEP 2113).

35. Claims 11, 13, 14, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bai (US 2004/0222412) in view of Shim (Moonsub Shim et al., "Polymer Functionalization for Air-Stable n-Type Carbon Nanotube Field-Effect Transistors", J. Am. Chem. Soc. 123, pp. 11512-11513 (2001)) in view of Takenaka (US 6,882,016) as applied to claim 7 above, and further in view of Sato (US 6,002,462).

36. Regarding claim 11

37. Bai in view of Shim in view of Takenaka teaches elements of the claimed invention above.

38. Bai in view of Shim in view of Takenaka does not teach the formation of a resin protective layer over the device.

39. Sato teaches an acrylic resin protective layer over a TFT array (column 8 lines 25-45).

40. It would have been obvious to one of ordinary skill in the art to form a protective resin layer over the device in order to protect the device from environmental contamination and damage.

41. Regarding claim 13

42. Sato teaches an acrylic resin protective layer over a TFT array (column 8 lines 25-45). Acrylic resin does not contain imine nitrogen.

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43. It would have been obvious to one of ordinary skill in the art to form a protective resin layer over the device in order to protect the device from environmental contamination and damage.

44. Regarding claim 14

45. Sato teaches an acrylic resin protective layer over a TFT array (column 8 lines 25-45). Acrylic resin does not contain imine nitrogen.

46. It would have been obvious to one of ordinary skill in the art to form a protective resin layer over the device in order to protect the device from environmental contamination and damage.

47. Regarding claim 15

48. Claims directed towards the structure of the device must distinguish from the prior art based upon structural differences rather than the processes by which the product is made (MPEP 2113).

49. Claims 16 through 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dodabalpur (US 6,278,127) in view of Shim (Moonsub Shim et al., "Polymer Functionalization for Air-Stable n-Type Carbon Nanotube Field-Effect Transistors", J. Am. Chem. Soc. 123, pp. 11512-11513 (2001)) in view of Bai (2004/0222412).

50. Regarding claim 16 and 20.

51. Dodabalpur teaches a method of making a semiconductor device. Said method comprises forming a gate electrode (14) formed on a substrate (11). Forming a gate insulation layer (15) formed on the gate electrode (14). Forming a source electrode (12) and a drain electrode (13) that are formed on the gate insulation layer (15). An n type



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semiconductor layer (21) formed between the source electrode (12) and the drain electrode (13) so as to contact with the source electrode (12) and the drain electrode (13) (fig 2) (column 5 lines 5-45). Said semiconductor comprises fullerenes (column 3 lines 45-60).

52. Dodabalpur does not teach the composition of the fullerene semiconductor layer.

53. Shim teaches a method of making an n type fullerene semiconductor layer. Said method of making n type fullerene semiconductor layer comprising nanotubes wherein an n type modifying polymer, polyethylene imine, is applied to a portion of the surface thereof only where the layer should be converted to a n type semiconductor (paragraphs 3-6).

54. It would have been obvious to one of ordinary skill in the art to use an n type fullerene comprising nanotubes with n type modifying polymer thereon in order to obtain an air stable n type semiconductor.

55. Dodabalpur in view does not teach that the n type modifying polymer is applied by an ink jet dispensing method.

56. Bai teaches that the polymers for making an organic TFT are dispensed by an ink jet method (paragraph 0043).

57. It would have been obvious to one of ordinary skill in the art to dispense the polymers using an ink jet method in order to minimize the amount of polymer used in the process.

58. Regarding claim 17

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59. Shin teaches that the modifying polymer is an imine nitrogen containing polymer, polyethylene imine (paragraph 4).

60. Regarding claim 18.

61. Shin teaches that the modifying polymer is a polyalkylne imine, polyethylene imine (paragraph 4).

62. Regarding claim 19.

63. Shin teaches that the modifying polymer is polyethylene imine (paragraph 4).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Goodwin whose telephone number is (571)272-8451. The examiner can normally be reached on Monday through Friday, 9:00am through 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571)272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DJG

*Andy Nguyen*  
Primary Examiner